

Serial No. 09/917,428

Docket No. 10008368-1

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A ~~miniaturized thin-film fuel cell device~~ for converting chemical energy of a fuel containing hydrogen into an electrical current without combustion, comprising:

a plurality of miniaturized thin-film fuel cells spaced from one another by a frame, each of the thin-film fuel cells including

a first manifold structure constructed from a first substrate having a first face surface and a first back surface and a plurality of first elongate fuel chamber chambers in fluid communication with each other defined therein for receiving the fuel, each of said first elongate fuel chamber chambers having an elongate opening along said first face surface and extending through the first substrate to define a first back opening along said first back surface;

a second manifold structure constructed from a second substrate having a second face surface and second back surface and a plurality of second elongate fuel chambers in fluid communication with each other defined therein for receiving the fuel, each of said second elongate fuel chambers having an elongate opening along said second face surface and extending through the second substrate to define a second back opening along said second back surface;

said first and second substrates being bonded together along said first and second back surfaces such that said plurality of first elongate fuel chambers are respectively in fluid communication said plurality of second elongate fuel chambers;

an a plurality of first elongate electrolyte electrolytes respectively secured between an anode first anodes positioned adjacent to said first elongate fuel chamber chambers and a cathode first cathodes positioned adjacent to an oxygen containing region, said first elongate electrolyte electrolytes operably

Serial No. 09/917,428

Docket No. 10008368-1

secured to the first face surface of said first substrate adjacent to said first elongate fuel ~~chamber~~ chambers thereby hydraulically isolating said first elongate fuel ~~chamber~~ chambers from the oxygen containing region; and

a plurality of second elongate electrolytes respectively secured between second anodes positioned adjacent to said second elongate fuel chambers and second cathodes positioned adjacent to the oxygen containing region, said second electrolytes operably secured to the second face surface of said second substrate adjacent to said second elongate fuel chambers thereby hydraulically isolating said second elongate fuel chambers from the oxygen containing region;

wherein fuel received within said first elongate fuel ~~chamber~~ chambers is operably engaged with the ~~anode~~ first anodes along the length of the elongate opening openings, and oxygen from the oxygen containing region is operably engaged with the ~~cathode~~ first cathodes such that when encouraged by a catalyst, hydrogen atoms from the fuel split into a proton and an electron, which take different paths to the ~~cathode~~ first cathodes thereby producing the electric current; and

wherein fuel received within said second elongate fuel chambers is operably engaged with the second anodes along the length of the second elongate openings, and oxygen from the oxygen containing region is operably engaged with the second cathodes such that when encouraged by a catalyst, hydrogen atoms from the fuel split into a proton and an electron, which take different paths to the second cathodes thereby producing electric current.

2. (Currently Amended) The ~~miniaturized thin-film fuel cell~~ device of claim 1, wherein said first substrate is a silicon wafer.

3. (Currently Amended) The ~~miniaturized thin-film fuel cell~~ device of claim 1, wherein said first substrate is a portion of a silicon wafer.

4. (Canceled)

5. (Currently Amended) The ~~miniaturized thin-film fuel cell~~ device of claim 1, wherein said ~~fuel cell is a~~ fuel cells are proton exchange membrane fuel cell cells and the ~~electrolyte is a~~ electrolytes comprise proton conducting electrolyte material.

Serial No. 09/917,428

Docket No. 10008368-1

6. (Currently Amended) The ~~miniaturized thin-film fuel cell device~~ of claim 5, wherein said proton conducting electrolyte material is a perfluorinated sulfonic acid polymer having a thickness between 50-100  $\mu\text{m}$ , inclusive.

7-11. (Canceled)

12. (Currently Amended) The ~~miniaturized thin-film fuel cell device~~ of claim 14 claim 1, wherein ~~said~~ the fluid communication between the elongate fuel chambers of the ~~plurality of said miniaturized thin-film fuel cells~~ is in a serpentine or parallel pattern.

13-17. (Canceled)

18. (Previously Presented) A thin-film fuel cell, comprising:  
a substrate defining a plurality of elongate fuel chambers with respective elongate fuel chamber openings; and  
a plurality of elongate fuel cells, including respective anodes and cathodes, secured to the substrate and positioned over respective elongate fuel chamber openings such that the anodes face the elongate fuel chambers and the cathodes are hydraulically isolated from the elongate fuel chambers.

19. (Previously Presented) A thin-film fuel cell as claimed in claim 18, wherein the substrate comprises a silicon wafer.

20. (Previously Presented) A thin-film fuel cell as claimed in claim 18, wherein the substrate comprises a portion of a silicon wafer.

21. (Previously Presented) A thin-film fuel cell as claimed in claim 18, wherein the elongate fuel cells comprise elongate proton exchange membrane fuel cells including a proton conducting electrolyte material between the anodes and cathodes.

*Serial No. 09/917,428*

*Docket No. 10008368-1*

22. (Previously Presented) A thin-film fuel cell as claimed in claim 21, wherein the proton conducting electrolyte material comprises a perfluorinated sulfonic acid polymer having a thickness between 50-100  $\mu\text{m}$ .

23. (Previously Presented) A thin-film fuel cell as claimed in claim 18, wherein the plurality of elongate fuel chambers are connected to one another.

24. (Previously Presented) A thin-film fuel cell as claimed in claim 18, wherein the plurality of elongate fuel chambers are connected to one another in series.

25. (Previously Presented) A thin-film fuel cell as claimed in claim 24, wherein the plurality of elongate fuel chambers define respective longitudinal ends and are connected to one another at the longitudinal ends.